AN EMPIRICAL STUDY OF THE RELATIONSHIP AMONG CUSTOMER-ORIENTED PROCESS, E-COMMERCE APPLICATIONS, AND BUSINESS PERFORMANCE

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Abstract - In this study, the author investigated the business performance (financial performance) by examining the factors of "customer-oriented Process," "E-Commerce applications," "customer satisfaction," and "business internal performance (non-financial performance)" from the business process survey. It indicates that the customer satisfaction and business internal performance (non-financial performance) could be improved by the way of E-commerce applications, operational processes, and customer-know-ledge processes. Besides, it is evidenced that the business performance (financial performance) could be improved by customer satisfaction and business internal performance.

Keywords - Customer Relationship Management (CRM), E-Commerce, Customer Satisfaction

I. INTRODUCTION

Customer relationship management is based on customers who are treated as "value-added assets" [1]. Customer relationship management (CRM) emphasizes that Business Process should be "customer"-oriented instead of "product"-oriented [2]. Now, corporate operational strategy has been transformed from product-basis to customer-basis[3]. 80% performance of product sales is based on 20% customers' purchase [4]. The cost to develop new customers is more than the cost to maintain old customers by five times. Now, firms focus on reinforcing customer relationship management by information technology [5] [6] [7]. The firms should also value long-term maintenance and management of customers[8].

A good customer relationship is the key to success in the market. A firm will keep his customers and obtain the profits by creating customers' values by business process of customer relationship management[9]. A firm must reconsider his customers' demands by IT business process. E-Commerce could be an IT technique of business process. E-Commerce enhance customer relation- ship by interaction between a firm and his customers [10].

This study intended to identify the factors of customer-oriented process in the E-Commerce environment that would enhance internal business efficiency and customer satisfaction.

II. LITERATURE REVIEW

Firms should keep the customers and treat customer relationship management as a dynamic circular system[1]. There are five steps in implementing CRM: (1)studying customers in the market, (2)describing corporate strategies, (3)training and communicating the employees, (4)improving internal process, and (5) evaluating customer values. Among them, "improving internal process" means that corporate internal process should emphasize the "customer value" to design its business process to retain customers[1]. CRM can be a customer-facing system of business process[11], strategy[12] [13],and methodology [14], to help firms recognizing and predicting current and potential customers.

Firms which implement customer relationship management must adjust Business Process and apply information technology. CRM should be the core strategy to integrate functions of internal process and external network for customer satisfaction [15] [16].This study will examine how the Customer-Oriented Process and E-Commerce Applicationaffect the business performance of implementing CRM.

A. Customer Oriented Process

The customer-oriented process is customer-centered instead of marketing, sales, production, or other function-based [17]. In other words, customer-oriented process is a series of cross-functional process and activities to continuously provide higher value for customers [18]. The customer-oriented process should be consistent with a firm's activities that are based on customer demands, instead of internal function [19].This study summarized the customer-oriented process into three phases: (1)supply-chain Involvement; (2)operational process; (3)customer knowledge process.

In supply-chain involvement, it would have a positive impact on business performance, if firms adopted customer-oriented strategies and utilized customer information for product development. It. indicated that suppliers' involvement in new product development could accelerate product development and reduce costs

of product development[20].

In operational process, customer-oriented process should improve internal business process for customer demands. The aim of operational CRM is to improve the effectiveness of internal operations and customer relationship management [21].

The customer knowledge management is a process of transforming customer information into positive interactions with customers[22].By customer knowledge management, firms immediately and precisely collect, manage, and delivery information related to customers, products, and services. According to the information, they improve customer satisfaction and decision-making [23-24].

A successful customer relationship management is based on effective transformation of customer information into customer knowledge [25-28]. Therefore, firms can integrate customer information and understand products' lifecycles, to enhance their competitiveness and profitabilitythrough the customer knowledge process.

By customer-oriented Business Process design, firms will acquire competitive advantages by providing higher customer values and services. It will also effectively enhance Internal business efficiency and external customer satisfaction. This study will examine that Customer Oriented Process would enhance customer satisfaction and Internal Business Efficiency of firms; thus, it proposed H1 and H2 below:

H1: There is a significant and positive correlation between Customer Oriented Process and customer satisfaction.

H2: There is a significant and positive correlation between Customer Oriented Process and Internal Business Efficiency.

B. E-Commerce Application

Information technology application is both the support for corporate activities,and the tool to create long-term and stable competitive advantages [29][30]. Due of information technology, firms can focus on data integration and customer support, which are the bases to enhance capacity of customer services. Information technology application plays critical role in corporate strategic planning.

E-Commerce is originated from firms' intention to simplify internal process, improve interaction with customers, and satisfy the need of exchanging information with partners. By E-Commerce and integration of SCM, ERP, and CRM, firms communicate and accomplish online transaction with customers or clients through internet.

The competitive advantage by construct internet value chain of suppliers, internal business, and customer relationship would increase market share, reduce marginal cost, and increase customer satisfaction. Besides, E-Commerce would enhance firm's customer relationship [31].

In other words, in E-Commerce environment, Business Process design is based on satisfaction of customers' needs. The most significant advantage of E-Commerce Application is to accelerate communication with customers, improve service-level, and reduce costs. It also enhances interaction with customers to lead to customer satisfaction [32]. Thus, E-Commerce application will reduce internal operational cost and increase operational efficiency. Based on the above, this study proposed H3 and H4:

H3: There is a significant and positive correlation between E-Commerce and customer satisfaction.

H4: There is a significant and positive correlation between E-Commerce and Internal Business Efficiency.

C. Customer Oriented Process and E-Commerce

E-Commerce plays critical roles in the process to transform from "product manufacturing-oriented" to "customer-oriented". Implementation of E-Commerce and Customer Oriented Process will enhance the interaction with customers. It can lead to global sales, expand new channels and markets, and integrate manufacturers and suppliers to attract more potential internet partners for the cooperation to enhance service quality. The most important is that it will enhance customer relationship management. Thus, the success of E-Commerce and customer relationship management will influence sustainable operation of the firms.

Customer-oriented process implementation will improve business process of sales and reduce information asymmetry between firms and customers. With the improvement of business operation efficiency, the company provides customers with good-quality products and services, improves customer satisfaction, and creates corporate financial performance. Therefore,

H5: There is a significant and positive correlation among Customer Oriented Process, E-Commerce Application, and customer satisfaction.

H6: There is a significant and positive correlation among Customer Oriented Process, E-Commerce Application, and Internal Business Efficiency.

Good services for customer satisfaction rely on the support of Business Process. Hence, firms must recognize the relationships among operational efficiency, customer satisfaction, and financial performance. Thus, this study attempted to find if the increase of Internal Business Efficiency and customer satisfaction would enhance business performance in order to validate if customer satisfaction was the key of long-term profits of firms. Therefore,

H7: There is a significant and positive correlation among Internal Business Efficiency, customer satisfaction, and corporate financial performance.

H7a: There is a significant and positive correlation between customer satisfaction and corporate financial performance.

H7b: There is a significant and positive correlation between Internal Business Efficiency and corporate financial performance.

III. RESEARCH METHOD

A. Questionnaire design

This study was conducted using Taiwan's listed manufacturing industry as a survey. It aimed to probe into the influences of E-Commerce Application and Customer Oriented Process on Internal Business Efficiency, customer satisfaction and firm's financial performance. The survey was issued and recycled in early 2016.A total of 800 questionnaires were sent and a total of 145 questionnaires were returned.

B. Variable definitions and measurements

This study defined the variables: (1) Customer Oriented Process; (2) E-Commerce Application; (3) non-financial performance; (4) Financial performance. The following topics are designed in the survey: customer and supplier involvement in R&D, improvement of customer related process,IT adoption in CRM implementation, B2B and B2C of E-Commerce, and improvement of internal process.

The business performance was classified as-non-financial performance and financial performance. Non-financial performance referred to "customer satisfaction" and "Internal Business Efficiency"; financial performance was based on "AVROA". Regarding customer satisfaction, the measurement was based on customers' satisfaction with the services of the firms. The items included refund rate, customer complaint rate, market share, and customer satisfaction. As for Internal Business Efficiency, the measurement was based on customer relationship management and internal efficiency, and the measures included cost reduction in Business Process, time saving, and effectiveness of customer relationship management. As for financial performance, Average ROA was the measuring item since ROA could effectively predict the influence of long-term customer relationship management. This study extracted AVROA of the subjects in 2014 and 2015 as the measures of financial performance.

C. Structural Equation Modeling

By construction of Structural Equation Modeling, this study validated the hypotheses. In Structural Equation model, square means measurable variables (items of questionnaire) and oval means unobservable variables (names of items). Unobservable exogenous variables (latent exogenous variables) included Supply-Chain Involvement (SCI), operational process (OP), customer knowledge process (CKP), and E-Commerce Application (EC). Measurable exogenous variables are shown below: SCI1~SCI2, OP1~OP4, CKP1~CKP3, and EC1~EC5. Unobservable endogenous variables (latent endogenous variables) included customer satisfaction (CS), Internal Business Efficiency (EFF), and corporate financial performance(AVROA). Measurable endogenous variables are shown below: CS1~CS4 and EFF1~EFF6. Structural Equation framework constructed by this study is shown in Figure 1:

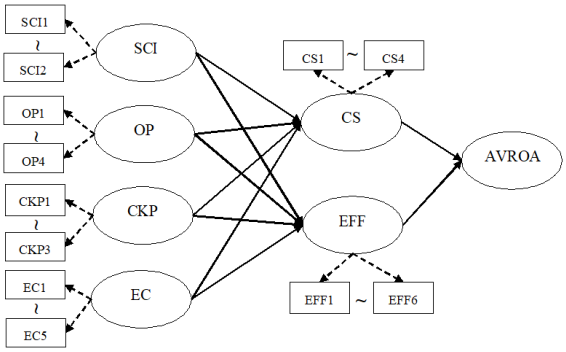


Figure 1 Structural equation model

D. Data Analysis

Data was analyzed by Visual Partial Least Square to examine the hypotheses in this study. First, the data is analyzed by descriptive statistics, factor analysis, reliability and validity analysis, and correlation analysis to test the reliability. Finally, covariance structure model analysis on overall dimensions was conducted.

Regarding covariance structure model, this study treated Partial Least Squares (PLS) as the analytical tool of Structural Equation Modeling (SEM). It is based on regression analysis and derived from Path Analysis [33]. It can examine measurement model of research tools, as well as Structural Model upon research concepts. Hypothesis of sample distribution of PLS was flexible and only required fewer samples. Furthermore, it could analyze complicated prediction models[34]. PLS would be suitable for structural model analysis if the number of samples was above 80 [35]. There were 134 valid questionnaires which met the threshold of PLS in this study. Moreover, model validation was based on two-stage SEM [36] [37], including Measurement Model and Structural Model. Measurement Model aimed to validate reliability and validity of the model, whereas Structural Model aimed to examine theoretical structure of the model. Besides, resampling of Bootstrap (500 resamples) was adopted to test the significance of paths in Structural Model.

IV. RESEARCH RESULTS

A. Descriptive analysis

According to valid returned questionnaires, as to industry category, most subject firms were in electronics industry (33%), and the second was electric machinery industry (20%). In addition, according to the result of chi-square, industry category of subject firms was not significantly different from population, which indicated that industry category of subject firms was representative. As to organizational scale of subject firms, most of them had200-1000 people (49%), and the second had 100-200 people (22%). As to foundation years of the firms, most of them had 21-30 years (29%), followed by 11-20 years (26%).

B. Reliability and validity analysis and correlation analysis

Firstly, factor extraction was based on principal component analysis. The factors with Eigenvalue were

examined, and whether factor loading of the items was above 0.5 was determined(Table 1). In addition, accumulated explained variance of sub-constructs should reach 60%. Attempts were also made to find if KMO was above 0.5 [38]. After factor analysis, "Supply-Chain Involvement", "operational process", "customers knowledge process", "E-Commerce Application", "customer satisfaction", and "Internal Business Efficiency" were generalized. Generally, the items revealed positive reliability and validity,illustrating that the factors revealed internal consistency in different constructs. The responses could indicate the subjects' real situations.

Table 1 Reliability and Validity Analysis

Factor	Eigen-value	accumulated explained variance	Cronbach's α	KMO (Bartlett's Test)
1. Supply-Chain Involvement (SCI)	1.217	68.984%	0.74	0.667(***)
2. Operational Process (OP)	2.923	58.709%	0.80	0.667(***)
3. Customer Knowledge Process (CKP)	1.546	77.305%	0.71	0.524(***)
4. E-Commerce Application (EC)	3.508	70.15%	0.89	0.796(***)
5. Customer Satisfaction (CS)	2.949	73.717%	0.877	0.799(***)
6. Internal Business Efficiency (EFF)	3.866	64.427%	0.888	0.864(***)

*** P<0.001

Moreover, correlation among the variables was examined by Pearson correlation coefficient. According to correlation coefficients in Table 2, it could beshown that factors of Customer Oriented Process and E-Commerce Application revealed significant and positive correlation with non-financial and financial performance of the firms.

Table 2 Pearson Correlation

Variable	1	2	3	4	5	6
1. Supply-Chain Involvement (SCI)	1.00					
2. Operational Process (OP)	0.364**	1.00				
3. Customer Knowledge Process (CKP)	0.216*	0.376**	1.00			
4. E-Commerce Application (EC)	0.085	0.245**	0.297**	1.00		
5. Customer Satisfaction (CS)	0.216*	0.420**	0.350**	0.282**	1.00	
6. Internal Business Efficiency (EFF)	0.237**	0.343**	0.446**	0.321**	0.810*	1.00

*** p<0.01, ** p<0.05, * p<0.1

C. Covariance structure model

Validation of Measurement Model included convergent validity and discriminant validity which were mainly validated by composite reliability (CR) and Average Variance Extractcd (AVE) [39] [40]. When composite reliability was above 0.7, it could be treated as high composite reliability [42]. AVE was suggested to be above 0.5[41]. When factor loading of the constructs in the variables was high (loading above 0.5), it would also meet convergent validity [42].

In Table 3, composite reliabilities of all variable were above the threshold value 0.7and AVE were above 0.5. It demonstrated that internal consistency of the measurement tools designed in this study was acceptable. Therefore, Measurement Model of this study was validated to meet convergent validity.

Table 3 AVE Analysis

Variable	AVE	Composite Reliability
1. Supply-Chain Involvement (SCI)	0.781	87.673%
2. Operational Process (OP)	0.644	87.695%
3. Customer Knowledge Process (CKP)	0.546	77.523%
4. E-Commerce Application (EC)	0.706	92.299%
5. Customer Satisfaction (CS)	0.762	92.763%
6. Internal Business Efficiency (EFF)	0.683	92.829%
7. Average ROA (AVROA)	1.000	1.000

After this study confirmed that the reliability and validity of variables were acceptable, the relationships between corresponding latent variables of the variables and other latent variables were probed into by PLS. Path coefficient was estimated by Bootstrap approach. The estimation was based on Resampling of data [43] and was more precise than commonly used Maximum Likelihood Estimation (MLE) [44]. Structural Model test aimed to estimate path coefficient and R^2. Path coefficient indicates intensity and direction of relationships among the variables. After the test, it should be significant and should be consistent with the hypotheses. R^2 means percentages of explained variance of exogenous variable on endogenous variables. It is the prediction power of the model. Path coefficient and R^2 both suggested the match between Structural Model and empirical data.

Validation in this study was based on PLS, and two important measures were β and R^2. β indicates correlation between independent and dependent variables;R^2 means explained power. Figure 2shows causal relationships and significance among latent variables. Regarding overall model, Customer Oriented Process (SCI, OP, and CKP), and E-Commerce Application (EC) on customer satisfaction (CS) was 28.5%.R^2 of Customer Oriented Process (SCI, OP, and CKP) and E-Commerce Application (EC) on Internal Business Efficiency (EFF) were 29.2%.R^2 of customer satisfaction (CS) and Internal Business Efficiency (EFF) on AVROA was 25.4%, illustrating that overall model revealed certain degree of explained power.

In Figure 2, path coefficient of Supply-Chain Involvement (SCI)on customer satisfaction (CS) was insignificant (β=0.093 and p-value; insignificant). H1a was not supported. However, path coefficients of operational process (OP) and customers knowledge process (CKP) on customer satisfaction (CS) were 0.272 and 0.152, respectively; significance was p<0.01 and p<0.05, respectively. H1b and H1c were supported. The research result partially supported H1. However, path coefficients of Supply-Chain Involvement (SCI), operational process (OP), and customers knowledge process (CKP) on Internal Business Efficiency (EFF) were 0.137, 0.186 and 0.210, respectively; significance was p<0.1, p<0.05, and p<0.01, respectively. H2 was supported. Path coefficient of E-Commerce Application (EC) on customer satisfaction (CS) was 0.255;significance was p<0.01. H3 was supported. Path coefficient of E-Commerce Application (EC) on Internal Business Efficiency (EFF) was 0.269;significance was p<0.01. H4 was supported. Thus, the findings partially supported H5 and H6. As to influences of customer satisfaction (CS) and Internal Business Efficiency (EFF) on corporate financial performance (AVROA) in overall model, it found that path coefficients of customer satisfaction (CS) and Internal Business Efficiency (EFF) on corporate fi-

nancial performance (AVROA) were 0.326 and 0.204, respectively; significance was p<0.01 and P<0.1, respectively. H7 was supported.

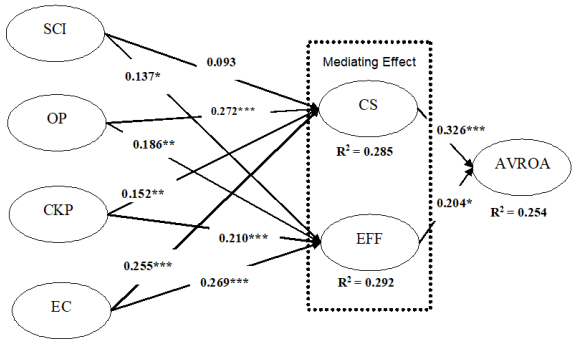


Figure 2 PLS Analysis

Regarding Structural Model tests above, findings of hypothesis validation in 500 resamples were reorganized in Table 8. Hypotheses in this study were statistically supported. Path relationships were all significant (p<0.1). Generally speaking, only Supply-Chain Involvement did not reveal significant and positive effect on customer satisfaction. Other variables significantly and positively influenced two moderators, customer satisfaction and Internal Business Efficiency. Furthermore, Internal Business Efficiency positively and significantly influenced corporate financial performance (AVROA). However, the significance was not as strong as influence of customer satisfaction on corporate financial performance (AVROA).

CONCLUSIONS AND SUGGESTIONS

This study aimed to illustrate that in E-Commerce environment, firms enhanced Internal Business Efficiency and customer satisfaction by implementing Customer Oriented Process to finally fulfill business performance. An empirical study was conducted on the correlations among Supply-Chain Involvement, operational process, customer know- ledge process in Customer Oriented Process and factors of E-Commerce on customer satisfaction, Internal Business Efficiency and corporate financial performance by covariance structure model.

It indicates that “operational process” and “customer knowledge process” in Customer Oriented Process will significantly enhance customer satisfaction and Internal Business Efficiency. Influence of “Supply-Chain Involvement” in Customer Oriented Process on increase of customer satisfaction and Internal Business Efficiency was not validated. The reason can be that manufacturers in Taiwan are mostly high-tech industries. In order to maintain confidentiality of product R&D, these firms usually do not invite suppliers and customers to participate in manufacturing or R&D of products. In addition, the reason can also be related to the degree of collaboration among firms.

Generally speaking, it is certain that implementation of Customer Oriented Process will enhance customer satisfaction and Internal Business Efficiency. Implementation of operational process aims to enhance effectiveness and efficiency of internal business and customer relationship management. In order to improve internal business process according to customers’ demands, firms must cooperate with internal departments to enhance customer related business process in order to increase internal operational efficiency and external customer satisfaction. By customer knowledge process, customer information could be recognized, the process could be integrated and analyzed, and product R&D could meet customer demands [21]. Customer knowledge process allows firms to recognize innovative opportunity in new market, reduce potential risk, and avoid producing products which do not meet customers’ needs; thus, product advantage, Internal Business Efficiency, and customer satisfaction will be enhanced. Empirical results also show that E-Commerce Application will increase customer satisfaction and Internal Business Efficiency. E-Commerce leads to two-way immediate communication, enhances coordination and support between the firms and customers, increases service quality, and reduces product cost [34]. Implementation of Customer Oriented Process and E-Commerce improves customer satisfaction and Internal Business Efficiency and further enhances overall financial performance, return on assets of the firms. By covariance structure model, this hypothesis was supported.

Upon perspective of customer relationship management, this study validated influences of Customer Oriented Process and E-Commerce Application on financial and non-financial performance. It allows the firms to clarify the key success process and factors in Customer Oriented Process, and can be applied in practical customer management process. This study suggested that in Customer Oriented Process, firms should focus on operational process operation and implementation of customer knowledge process, and fulfill overall process management by E-Commerce Application. Thus, the internal business process and customer relationship management would be more effective, and corporate performance could be improved.

This study conducted a questionnaire survey and empirical analysis by public financial information of the firms to enhance objectivity of the findings. However, results of the questionnaire were influenced by the participants’ subjective consciousness, and there would be certain degree of errors. In addition, this study treated the listed manufacturers in Taiwan as samples, and the research findings might not be applicable to other industries. Furthermore, this study only focused on relationships among Customer Oriented Process, E-Commerce Application, and business performance. It was suggested that future

studies could analyze and study other variables of business performance in order to provide more specific suggestions and assistance for the business circle.

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Appendix: Business Process Survey (Partial)

1. Does your company implement the following matters with your customers?	Strong Disagree	Disagree	Not allowed	Agree	Strong Agree
(1) Improve the internal business processes in response to customer requirements.	1	2	3	4	5
(2) Reforming and improving customer-related business processes	1	2	3	4	5
(3) Reforming and improving the business processes of related suppliers or third parties.	1	2	3	4	5
(4) Customer participation in product development	1	2	3	4	5
(5) Collaborate with relevant departments within the company to improve and reform business processes	1	2	3	4	5
(6) suppliers or third parties participate in product development.	1	2	3	4	5

2. Does your company implement a new management system?	Not Established	Partial Established	Full Established
(1) Establishing Customer Relationship Management (CRM)	1	2	3
(2) Establishing Knowledge Management (KM)	1	2	3
(3) Establishing Data Management (DM)	1	2	3

3. Does your company implement the following business processes?	Not Established	Partial Established	Full Established
(1) B2C Process (Business process between firm and customers)	1	2	3
(2) B2B Process (Business process between firm and suppliers)	1	2	3
(3) B2B Process (Business process between firm and other divisions)	1	2	3
(4) Internal Process for Operating and Marketing	1	2	3
(5) Internal Process for Supporting Management	1	2	3

4. How effective is your company after implementing business process?	Very unsatisfied	Not Satisfied	Not allowed	Satisfied	Very Satisfied
Product costs reduced.	1	2	3	4	5
(2) Inventory costs reduced.	1	2	3	4	5
(3) Productivity of the operating department improved.	1	2	3	4	5
(4) production cycle efficiency increased.	1	2	3	4	5
(5) Return rate and customer complaint rate decreased.	1	2	3	4	5
(6) Delivery of products increased.	1	2	3	4	5
(7) Customer satisfaction raised.	1	2	3	4	5
(8) Market share increased.	1	2	3	4	5
(9) Customer loyalty Increased	1	2	3	4	5
(10) Investment efficiency increased	1	2	3	4	5